CLMPTO

1. A method comprising:

comparing information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the tes object,

wherein the derivable information being compared relates to a shape of the scanning interferometry signal for the first surface location of the test object.

2. The method of claim 1, further comprising determining an accurate characteristic for the test object based on the comparison.

3. The method of claim 1, further comprising determining a relative surface height for the first surface location based on the comparison.

4. The method of claim 3, wherein the determining of the relative surface height comprises determining which model corresponds to an accurate one of the characteristic for the test object based on the comparison, and using the model corresponding to the accurate characteristic to calculate the relative surface height.

5. The method of claim 4, wherein using the model corresponding to the accurate characteristic to calculate the relative surface height comprises determining a position of a peak in a correlation function used to compare the information for the test object to the information for the model corresponding to the accurate characteristic.

6. The method of claim 1, further comprising comparing information derivable from the scanning interferometry signal for additional surface locations to the information corresponding to the multiple models.

7. The method of claim 6, further comprising determining a surface height profile for the test object based on the comparisons.

8. The method of claim 1, wherein the comparing comprises calculating one or more merit functions indicative of a similarity between the information derivable from the scanning interferometry signal and the information corresponding to each of the models.

9. The method of claim 1, wherein the comparing comprises fitting the information derivable from the scanning interferometry signal to an expression for the information corresponding to the models.

10. The method of claim 1, wherein the information for the test object relates to a fringe contrast magnitude in the shape of the scanning interferometry signal.

11. The method of claim 1, wherein the information for the test object relates to relative spacings between zero-crossings in the shape of the scanning interferometry signal.

12. The method of claim 1, wherein the information for the test object is a expressed as a function of scan position.

13. The method of claim 12, wherein the comparing comprises calculating a correlation function between the information for the test object and the information for each of the models.

14. The method of claim 12, wherein the comparing further comprises determining one or more peak values in each of the correlation functions.

15. The method of claim 14, further comprising determining an accurate characteristic for the test object based on the parameterization of the model corresponding to the largest peak value.

16. The method of claim 14, further comprising determining a relative surface height for the test object at the first surface location based on a coordinate for at least one of the peak values in the correlation functions.

17. The method of claim 1, wherein the scanning interferometry signal is produced by a scanning interferometry system, and wherein the comparing comprises accounting for systematic contributions to the scanning interferometry signal arising from the scanning interferometry system.

18. The method of claim 17, further comprising calibrating the systematic contributions of the scanning interferometry system using another test object having known properties.

19. The method of claim 1, wherein the series of characteristics comprises a series of values for at least one physical parameter of the test object.

20. The method of claim 19, wherein the test object comprises a thin film layer having a thickness, and the physical parameter is the thickness of the thin film at the first location.

21. The method of claim 1, wherein the series of characteristics comprises a series of characteristics of the test object at a second surface location different from the first surface location.

22. The method of claim 21, wherein the test object comprises structure at the second surface location that diffracts light to contribute to the scanning interferometry signal for the first surface location.

23. The method of claim 21, wherein the series of characteristics at the second surface location comprises permutations of a magnitude for a step height at the second location and a position for the second location.

24. The method of claim 21, wherein the series of characteristics at the second surface location comprises permutations of a modulation depth for a grating and an offset position of the grating, wherein the grating extends over the second location.

25. The method of claim 1, wherein the series of characteristics is a series of surface materials for the test object.

26. The method of claim 1, wherein the models correspond to a fixed surface height for the test object at the first surface location.

27. The method of claim 1, wherein the scanning interferometry signal is produced by imaging test light emerging from the test object to interfere with reference light on a detector, and varying an optical path length difference from a common source to the detector between interfering portions of the test and reference light, wherein the test and reference light are derived from the common source, and wherein the scanning interferometry signal corresponds to an interference intensity measured by the detector as the optical path length difference is varied.

28. The method of claim 27, further comprising producing the scanning interferometry signal.

29. The method of claim 27, wherein the test and reference light have a spectral bandwidth greater than 5% of a central frequency for the test and reference light.

30. The method of claim 27, wherein the common source has a spectral coherence length, and the optical path length difference is varied over a range larger than the spectral coherence length to produce the scanning interferometry signal.

31. The method of claim 27, wherein optics used to direct test light onto the test object and image it to the detector define a numerical aperture for the test light greater than 0.8.

32. The method of claim 28, wherein the common source is a spatially extended source.

33. Apparatus comprising:

a computer readable medium having a program that causes a processor in a computer to compare information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the test object,

wherein the derivable information being compared relates to a shape of the scanning interferometry signal for the first surface location of the test object.

34. Apparatus comprising:

a scanning interferometry system configured to produce a scanning interferometry signal; and

an electronic processor coupled to the scanning interferometry system to receive the scanning interferometry signal and programmed to compare information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the test object,

wherein the derivable information being compared relates to a shape of the scanning interferometry signal for the first surface location of the test object.

35. A method comprising:

comparing information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the test object,

wherein the series of characteristics comprises a series of characteristic of the test object at a second surface location different from the first surface location.

36. The method of claim 35, wherein the test object comprises structure at the second surface location that diffracts light to contribute to the scanning interferometry signal for the first surface location.

37. The method of claim 35, wherein the series of characteristics at the second surface location comprises permutations of a magnitude for a step height at the second location and a position for the second location.

38. The method of claim 35, wherein the series of characteristics at the second surface location comprises permutations of a modulation depth for a grating and an offset position of the grating, wherein the grating extends over the second location.

39. The method of claim 35, further comprising determining an accurate characteristic for the test object based on the comparison.

40. The method of claim 35, further comprising determining a relative surface height for the first surface location based on the comparison.

41. The method of claim 40, wherein the determining of the relative surface height comprises determining which model corresponds to an accurate one of the characteristic for the test object based on the comparison, and using the model corresponding to the accurate characteristic to calculate the relative surface height.

42. The method of claim 41, wherein the using of the model corresponding to the accurate characteristic comprises compensating data from the scanning interferometry signal to reduce contributions arising from the accurate characteristic.

43. The method of claim 42, wherein the compensating of the data comprises removing a phase contribution arising from the accurate characteristic from a phase component of a transform of the scanning interferometry signal for the test object, and wherein the using of the model corresponding to the accurate characteristic further comprises calculating the relative surface height from the phase component of the transform after the phase contribution arising from the accurate characteristic has been removed.

44. The method of claim 42, wherein using the model corresponding to the accurate characteristic to calculate the relative surface height comprises determining a

position of a peak in a correlation function used to compare the information for the test object to the information for the model corresponding to the accurate characteristic.

45. The method of claim 35, further comprising comparing information derivable from the scanning interferometry signal for additional surface locations to the information corresponding to the multiple models.

46. The method of claim 45, further comprising determining a surface height profile for the test object based on the comparisons.

47. The method of claim 35, wherein the comparing comprises calculating one or more merit functions indicative of a similarity between the information derivable from the scanning interferometry signal and the information corresponding to each of the models.

48. The method of claim 35, wherein the comparing comprises fitting the information derivable from the scanning interferometry signal to an expression for the information corresponding to the models.

49. The method of claim 35, wherein the information derivable from the scanning interferometry signal and which is being compared is a number.

50. The method of claim 35, wherein the information derivable from the scanning interferometry signal and which is being compared is a function.

51. The method of claim 50, wherein the function is a function of spatial frequency.

52. The method of claim 50, wherein the function is a function of scan position.

53. The method of claim 35, wherein the information for the test object is derived from a transform of the scanning interferometry signal for the test object into a spatial frequency domain.

54. The method of claim 53, wherein the transform is a Fourier transform.

55. The method of claim 53, wherein the information for the test object comprises information about an amplitude profile of the transform.

56. The method of claim 53, wherein the information for the test object comprises information about a phase profile of the transform.

57. The method of claim 35, wherein information for the test object relates to a shape of the scanning interferometry signal for the test object at the first location.

58. The method of claim 57, wherein the information for the test object relates to a fringe contrast magnitude in the shape of the scanning interferometry signal.

59. The method of claim 57, wherein the information for the test object relates to relative spacings between zero-crossings in the shape of the scanning interferometry signal.

60. The method of claim 57, wherein the information for the test object is a expressed as a function of scan position, wherein the function is derived from the shape of the scanning interferometry signal.

61. The method of claim 35, wherein the comparing comprises calculating a correlation function between the information for the test object and the information for each of the models.

62. The method of claim 61, wherein the correlation function is a complex correlation function.

63. The method of claim 61, wherein the comparing further comprises determining one or more peak values in each of the correlation functions.

64. The method of claim 63, further comprising determining an accurate characteristic for the test object based on the parameterization of the model corresponding to the largest peak value.

65. The method of claim 63, further comprising determining a relative surface height for the test object at the first surface location based on a coordinate for at least one of the peak values in the correlation functions.

66. The method of claim 35, wherein the scanning interferometry signal is produced by a scanning interferometry system, and wherein the comparing comprises accounting for systematic contributions to the scanning interferometry signal arising from the scanning interferometry system.

67. The method of claim 66, further comprising calibrating the systematic contributions of the scanning interferometry system using another test object having known properties.

68. Apparatus comprising:

a computer readable medium having a program that causes a processor in a computer to compare information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the test object,

wherein the series of characteristics comprises a series of characteristic of the test object at a second surface location different from the first surface location.

69. Apparatus comprising:

a scanning interferometry system configured to produce a scanning interferometry signal; and

an electronic processor coupled to the scanning interferometry system to receive the scanning interferometry signal and programmed to compare information derivable from a scanning interferometry signal for a first surface location of a test object to information corresponding to multiple models of the test object, wherein the multiple models are parametrized by a series of characteristics for the test object,

wherein the series of characteristics comprises a series of characteristic of the test object at a second surface location different from the first surface location.

70. A method comprising:

chemically mechanically polishing a test object;

collecting scanning interferometry data for a surface topography of the test object; and

adjusting process conditions for the chemically mechanically polishing of the test object based on information derived from the scanning interferometry data.

Cancelled claim 71

72. The method of claim 70, where the process conditions comprise at least one of pad pressure and polishing slurry composition.